**CLASS VI LOGGING AND TESTING**

**INJECTION WELL 357-7R**
**40 CFR 146.82(c)(4),(7) and 146.87(a)(1)-(3)**

**ELK HILLS A1-A2 PROJECT**

## Injection Well 357-7R Logging and Testing

The 357-7R injection well is being repurposed for the Elk Hills A1-A2 project. The 357-7R well has been approved by California Geologic Energy Management (CalGEM) for Class II pressure maintenance using gas as injectate.

### Deviation Checks During Drilling

Deviation checks for 357-7R were acquired during drilling every ten feet from 3,540.52 feet true vertical depth (TVD) to bottom hole at 8,995.93 feet TVD (Figure 1).

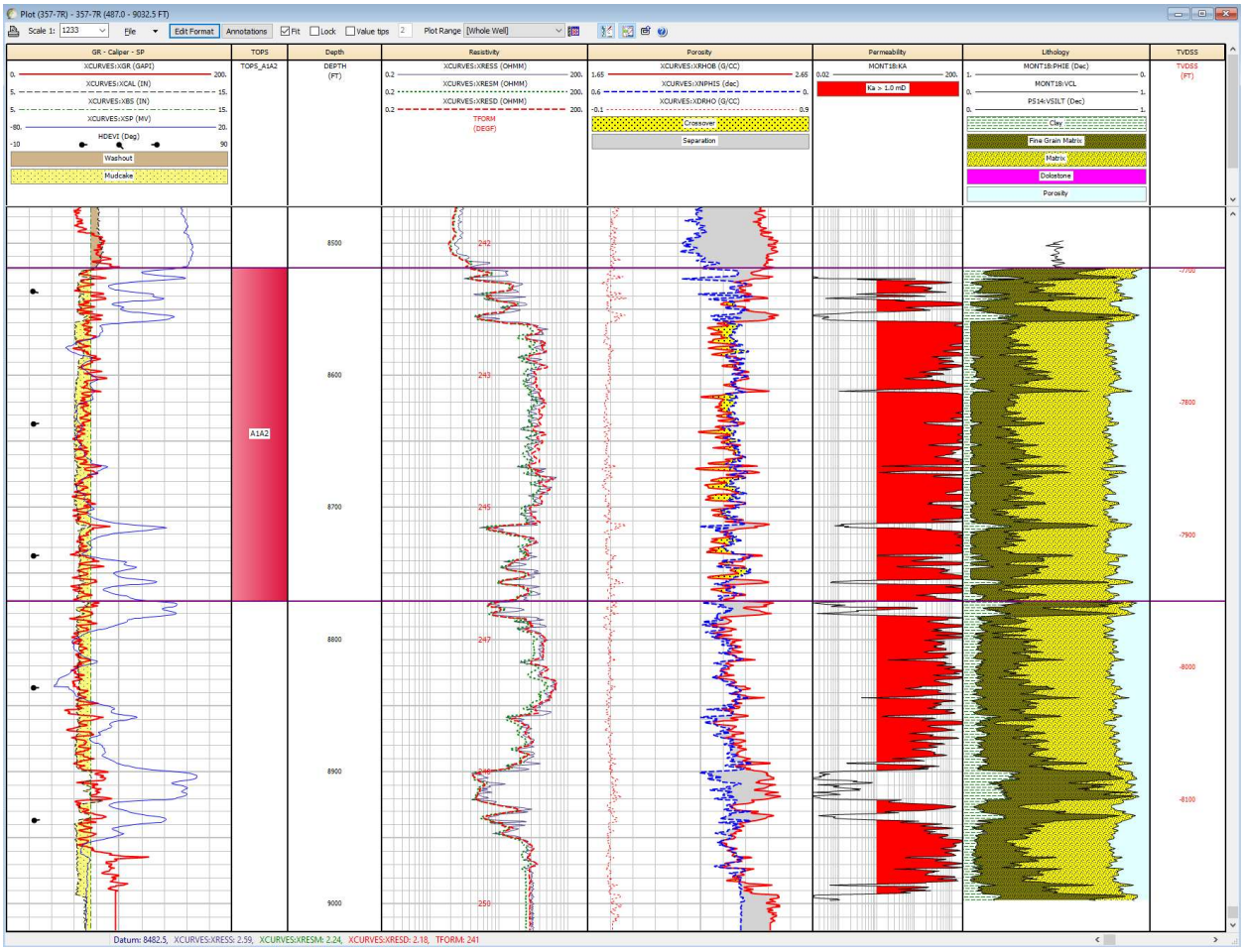
**Figure 1: Deviation checks during drilling for the 357-7R well.**

| X<br>*ftUS* | Y<br>*ftUS* | Z<br>*ft* | MD<br>*ft* | Inclination<br>*deg* | Azimuth GN<br>*deg* | Azimuth TN<br>*deg* | DX<br>*ftUS* | DY<br>*ftUS* | DX TN<br>*ftUS* | DY TN<br>*ftUS* | TVD (Well datum)<br>*ft* | TWT<br>*ms* | DLS<br>*deg/100ft* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6100830.00 | 2309245.00 | 812.00 | 0.00 | 0.00 | 165.70 | 164.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| 6100843.74 | 2309191.11 | -2728.52 | 3541.10 | 1.80 | 165.70 | 164.82 | 13.74 | -53.89 | 14.56 | -53.68 | 3540.52 | | 0.05 |
| 6100843.83 | 2309190.81 | -2738.51 | 3551.10 | 1.80 | 158.50 | 157.62 | 13.83 | -54.19 | 14.67 | -53.97 | 3550.51 | | 2.26 |
| 6100843.91 | 2309190.53 | -2748.51 | 3561.10 | 1.50 | 170.00 | 169.12 | 13.91 | -54.47 | 14.75 | -54.25 | 3560.51 | | 4.45 |
| 6100843.95 | 2309190.28 | -2758.51 | 3571.10 | 1.40 | 174.30 | 173.42 | 13.95 | -54.72 | 14.79 | -54.50 | 3570.51 | | 1.48 |
| 6100843.98 | 2309190.03 | -2768.40 | 3581.00 | 1.60 | 170.00 | 169.12 | 13.98 | -54.97 | 14.83 | -54.75 | 3580.40 | | 2.32 |
| | | | | | | | | | | | | | |
| 6100947.59 | 2308941.03 | -8136.56 | 8957.60 | 2.30 | 76.40 | 75.52 | 117.59 | -303.97 | 122.25 | -302.14 | 8948.56 | | 0.00 |
| 6100947.98 | 2308941.13 | -8146.45 | 8967.50 | 2.30 | 75.00 | 74.12 | 117.98 | -303.87 | 122.63 | -302.03 | 8958.45 | | 0.57 |
| 6100948.36 | 2308941.23 | -8156.45 | 8977.50 | 2.30 | 76.40 | 75.52 | 118.36 | -303.77 | 123.02 | -301.93 | 8968.45 | | 0.56 |
| 6100948.75 | 2308941.30 | -8166.44 | 8987.50 | 2.20 | 80.70 | 79.82 | 118.75 | -303.70 | 123.41 | -301.84 | 8978.44 | | 1.96 |
| 6100949.12 | 2308941.36 | -8176.43 | 8997.50 | 2.10 | 82.10 | 81.22 | 119.12 | -303.64 | 123.78 | -301.78 | 8988.43 | | 1.13 |
| 6100949.39 | 2308941.40 | -8183.93 | 9005.00 | 2.10 | 82.10 | 81.22 | 119.39 | -303.60 | 124.05 | -301.74 | 8995.93 | | 0.00 |

### 357-7R Open Hole Log Analysis: Before Installation of Long String

Open-hole wireline log data was acquired in 357-7R with measurements that include but are not limited to spontaneous potential, natural gamma ray, borehole caliper, resistivity, neutron porosity and bulk density (Figure 2).

**Figure 2: Open-hole well logs for 357-7R before installation of long string.**




## 357-7R Cased Hole: After Installation of Long String

The cement bond log seismogram and percent bond show isolation between the injection zone and shallow formations. Late seismogram arrivals show the presence of cement throughout the interval and bond from cement to formation. Early, low amplitude seismogram signal shows bond between pipe and cement (Figure 3).

**Figure 3: Cement bond log example for 357-7R, after installation of long string casing. The Monterey Formation A1-A2 top is at 8,518 feet.**